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1. Rogers, M. P., and Gray, C. L.: *Am. J. Digest. Dis.* 19:180, 1954.

TABLE of CONTENTS

60th year of publication

Vol. 60, No. 11



November, 1953

EDITORIAL

Rehabilitation in the Home After a Stroke	585
---	-----

ORIGINAL ARTICLES

Postpartum Hemorrhage	589
<i>Albert F. Lee, M.D. and Walter S. Keifer, M.D.</i>	
Disability Evaluation	595
<i>Earl D. McBride, M.D.</i>	
Substernal Pain and the Functional Esophagus	599
<i>Harold C. Klein, M.D.</i>	

CURRENT LITERATURE

Diagnosis of Endocrine Disease	607
<i>Louis J. Soffer, M.D.</i>	
Etiology and Treatment of Atherosclerosis	609
<i>J. Pomeranze, M.D.</i>	
Endometriosis	611
<i>Roland Bieren, M.D.</i>	
Prevention of Kidney Stones	613
<i>F. C. Bartter, M.D.</i>	

THERAPEUTIC TRENDS	615
AIDS IN DIAGNOSIS	617
NEW PHARMACEUTICAL PRODUCTS	619
LITERATURE SERVICE	621

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Chronic suppurative sinusitis	3	3
Coryza, Head cold, Catarrhal rhinitis	58	51
Influenza	2	1
Acute catarrh	4	3
Hypertrophic rhinitis	12	12
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* Eye, Ear, Nose and Throat Monthly 22:512 (Sept.) 1953.

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EDITORIAL

Rehabilitation in the Home After a Stroke

Management of the hemiplegic patient frequently fails to embrace preparation for function.

JAMES M. NORTHINGTON, M.D., *Editor*

There are over 1,000,000 hemiplegic patients in the United States, making the "stroke" the third major cause of death. Most of these patients are in homes, private or public. A specialist in physical medicine¹ offers valuable practical suggestions for treatment by the family doctor.

Management of the hemiplegic patient frequently fails to embrace preparation for function. This preparation begins at the moment the stroke occurs.

DURING ACUTE STAGE

In order to prevent deformity which could increase probable and possible disability, the following suggestions are made:

During the period of being bed-fast place a pillow in the axilla with the arm in abduction to avoid contracture of the shoulder structures. Place sandbags (sacks of salt, etc.) along the lateral edge of the thigh and leg to prevent external rotation, a deterrent to adequate walking. To prevent plantar flexion (drop foot) or later contracture, a foot board or any similar object is used to keep the foot in a normal position.

AFTER ACUTE STAGE

Once the acute stage has passed, passive movement by a member of the family, supervised at first by the doctor, helps to prevent atrophy. No special training is required to teach

a patient to inhale and exhale deeply, to increase the vital capacity of the lungs; contractions of the gluteal and quadriceps muscles will prepare him for walking. A clothesline attached to the foot of the bed, ending with a piece of broom-handle, will enable the patient to pull himself to a sitting position, restoring a sense of balance and effecting a change in position.

Early ambulation is as important in such cases as in any in the whole realm of medicine and surgery. If the function of the quadriceps of an affected leg has not returned, support must be provided to prevent "buckling" of the affected knee. A simple device may be made by anyone at all handy with tools, to be used as soon as a patient is able to be on his feet — however slightly — to help strengthen and prepare him for a permanent brace made to order by a competent prosthetic maker. In providing any brace, the limitations of a patient with one functioning hand should be considered. For instance, it is more practical to use straps with buckles rather than laces.

Teach the patient to put his heel down first and to "roll" his foot in its entirety on any surface. Put the affected hand in a coat pocket to help maintain balance, also to avoid drawing attention to the patient's disability.

Forewarn the family of possible reactions such as desire to be alone, weeping spells, self-pity, perversity, and even unfounded suspicion, and resentment prompted by dependency. A direct and casual attitude in establishing exercises and rehabilitation schedules can offset the despair of helplessness and despondency.

ESTABLISHING A NORMAL SCHEDULE

The sooner a reasonably normal

schedule is established the better. This program should include any suggestions made by the patient. He should eat with the family where customary family discussions should be carried on; avoid situations which would point to his disability. Do not treat him as a child; let him gauge his own powers. Letting the patient share in family problems increases his feeling of being a part of normal living.

Visits of friends and relatives is a cheering stimulus to recovery. The family must adjust the tempo between the household and the patient.

Communication is very important to these people; television and radio have proved themselves to be great boons.

Instruction includes care of one's personal toilet, his bed, and of the area in which he lives. Good appearance of the patient makes for an orderly life.

AIDS TO COMFORT

Experience with a great number of such patients leads to the following recommendations:

A comfortable straight chair is best, not too low.

A low household bed with firm or foam rubber mattress.

A wheel chair for non-ambulatory patients.

Railings of pipe or wood for the patient whose gait is unsteady.

A card rack made of wood or cloth is a help for the "card fancier".

"Obstacles courses" are hazardous. Scatter rugs, highly polished floors, low stools, etc., may cause serious falls.

A dim night light in the bedroom and passage to the bathroom is an important safety precaution.

Sliding or skull temple glasses are most easily managed. Bifocals are more hazardous than two pairs—one

for reading the other for distant use.

Growing plants, pets, etc., aid in offsetting the boredom of a humdrum existence.

An elongated shoe horn simplifies putting on shoes. Straps and buckles on shoes are easier to adjust.

Whenever possible the commode should have bar arrangements to provide needed support.

An electric razor, a "made-up necktie" and elastic suspenders are accepted gratefully.

Special work boards can be used with wheel chair or arm chair.

All clothing should be fastened

with buttons or—preferably—zippers. Dresses that open their entire length are best.

For the housewife unable to perform household chores in the usual way, a handyman can provide practical aids.

There needs to be more in the nature of personalized convenience or "gadgets". A sympathetic glance at a living mechanism who surrenders himself to the hapless incarceration of invalidism is a tragic sight. Animal comforts are sufficient for human existence, but the addition of some degree of introspection on the part of the general practitioner could bring happiness to the September days of the hemiplegic.

I. M. B. Ferderber, *Pennsylvania Med. Jour.*, 56: 798, 1953.

Remissions in Leukemia Following Acute Infectious Disease

Case histories are cited of 11 children with lymphatic leukemia who developed infections during the course of their leukemia. Marked clinical and hematological remission of the leukemia was observed in 2 children with hemolytic staphylococcus septicemia, in one child with varicella and in one child who had been injected with the feline panleukopenia virus. Similar but less complete effects were observed in 6 other children with one or more of the above conditions.

The sequence of events in these remissions was as follows. A child with acute leukemia, with a high or low leukocyte count, and with or without a marked granulopenia, developed an infection that was fol-

lowed by fever, marked drop in the peripheral leukocyte count, and occasionally by a hyperplastic phase in the bone marrow. If the patient survived this phase, the hemogram returned toward normal and a temporary clinical remission could occur. In all cases the leukemic process returned, and no evidence is available to show that such remissions were associated with a significant prolongation of life. The rapid and almost complete return toward normal hematological and clinical values in some children with fulminant leukemia following acute infections is a strong indication that some major features of leukemia are reversible.

H. R. Bierman, et al, *Cancer*, 6: 591, 1953.

THE ABUSE OF BED REST IN CARDIAC THERAPY

Austin Flint advised exercise within the limits that could be borne without discomfort for all types of cardiac weakness, and he noted that "patients exchanging habits of activity for complete rest are likely to become rapidly worse." In the latter part of the 19th century, a method of graduated exercises for increasing the strength of the heart was quickly accepted in Europe. Somewhat later the Neuheim form of treatment by baths and passive gymnastics was in vogue.

Since the first part of the 20th century, the pendulum has swung from the principle of exercise advocated by the early writers to the concept of absolute bed rest, particularly in the therapy of patients with congestive failure.

Disadvantages of prolonged bed rest (1) on systems other than the circulatory include bone atrophy and muscular wasting with its weakness, constipation and cathartic habituation, symptoms of urinary obstruction, particularly in elderly men, and decubitus ulcer, (2) on the circulatory system—vertigo, weakness, and even syncope, when the patient who has been confined to bed rest for long periods of time first assumes a sitting or standing position. It is a potent factor in the production of cardiac neuroses. Pulmonary edema, venous thromboses and pulmonary emboli.

The concept that bed rest with the patient recumbent is best treatment

has been shown to be erroneous. In a normal, resting recumbent adult, the output of the heart may be 5.3 liters per min., falling to 4 liters per min. on quiet standing. One factor of increased cardiac output in the normal heart in recumbency is increased diastolic filling.

For years the patient suffering from congestive failure has known that bed is often the one place in which he is the least comfortable. Elevating the head of the bed is not as effective as treating the patient out of bed in a chair. Edema formation in the legs is benign, but edema formation in the lungs can be fatal.

The cardiac patient treated on bed rest is prone to develop thromboembolism.

Placed at complete bed rest, the patient senses the gravity of his affliction. Cardiac neuroses prevention is relatively easy; the therapy may be extremely difficult.

Excepting those patients in shock, those with such disability that physically they cannot sit up, and those with a fresh deep skin thrombus, the sickest patients often derive the greatest benefit from the chair. Patients with myocardial infarction, in congestive failure, pulmonary edema, and cyanosis who appear to be extremely ill, one often observes clearing with the patient in the sitting position and improvement of mental outlook

N. F. Wyatt, et al, *Virginia Med. Monthly*, 80:419, 1953.

ORIGINAL ARTICLES

Postpartum Hemorrhage

Reduction of deaths from infection and toxemia leaves hemorrhage as the major obstetrical problem.

ALBERT F. LEE, M.D. and WALTER S. KEIFER, M.D.,
Seattle, Washington

Progress in obstetrical technique has greatly improved the outlook for both mother and infant. Improved, less-traumatic technics, better cleansing of tissues and instruments and recent chemotherapy have reduced infection as an obstetrical problem. The "unclean" obstetrical patient who receives modern therapy is indeed so readily made afebrile that she is rarely isolated from her normal ward counterpart. "Childbed" fever now becomes almost a historic disease.

In this day of better nutrition, scientific prenatal care and newer concepts of earlier treatment, advanced toxemia and eclampsia are rare occurrences for study and teaching. Many residents and nurses have never seen the convulsions, acute pulmonary edema and deaths in coma which occurred formerly

in obstetrical clinics. Success in reducing deaths from infection and toxemia, leaves hemorrhage as the major obstetrical problem. We have done little to lessen bleeding from traumatic obstetrical procedures, less to solve the problems of premature separation of the placenta, placenta praevia and other organic complications which cause hemorrhage in mothers. Hemorrhage as a cause of maternal death has increased from an average of 16% from 1931 to 1940, 23% in 1940, to 31% in 1947.¹ With our blood banks and the freer use of transfusions some advances have been made; early, accurate diagnosis with prompt and adequate treatment will go far toward conquering the last

1. Maternal Mortality by Cause, United States, 1947: Federal Security Agency, 31:10, September 9, 1949.

of the triad of killers of the obstetrical patient.

DIAGNOSIS

Excessive bleeding following a delivery may have its origin in the care or lack of care during the prenatal period. The patient who has an untreated secondary anemia, an undiagnosed anemia peculiar to the pregnant state, a nutritional or protein deficiency, or chronic urinary or other infection faces labor and postpartum days with uncertainty. The rigors of labor with exhaustion, dehydration and sudden changes in hemic and intrauterine dynamics may be sufficient to begin this type of new mother on a sudden or slow course of bleeding after delivery, which could be crippling or even fatal. These problems are to be recognized and dealt with during the prenatal period.

Common uterine causes of postpartum hemorrhage are atony, tumors and retained placental tissues. Uterine atony is rarely a prime disease, but rather an endproduct of uterine fatigue, prolonged poor pains and general exhaustion of the patient. The mother who has had a hard, prolonged labor, with or without inertia, will often conclude her labor with a boggy and non-responsive uterus. This fatigued mother, with or without dehydration and sometimes heavily sedated is the usual candidate for uterine atony. This atony may be also a secondary factor in placenta praevia, premature separation of the placenta, uterine fibroids or even uterine rupture. Atony as a pure disease after a normal delivery in a healthy mother does occur and is probably due to a disrupted uterine muscle metabolism.

An understanding of the background for uterine atony is important in connection with treatment. Attention to the uterus alone should

be extended to treatment of the patient herself.

Space-occupying uterine tumors, such as fibroids, which will not allow a uterus to contract and close off blood spaces after delivery may cause massive hemorrhage. These tumors, intramural or pedunculated, may cause hemorrhage because of increased vascularity or because of interference with contraction of the uterine fundus preventing constriction of the vascular bed of the placenta. These conditions may or may not be associated with atony and subinvolution.

Premature separation of the placenta and various degrees of placenta praevia manifest themselves usually prior to the onset of labor or shortly thereafter. The history and careful examination will lead to the correct diagnosis. Placenta praevia with the ragged and irregular placental attachment in the non-contractile bed low in the uterus will give a soft, friable tissue poorly responsive to oxytocics, packing and other technics.

Bleeding early in a pregnancy may be caused by a blighted ovum, hydatidiform mole, chorionepithelioma, cervical erosion or polyp, decidual reaction of the cervix, cervical or vaginal varices, or neoplastic lesions. Here again the history, adequate examination coupled with microscopic findings will reveal the responsible offender.

Latent postpartum bleeding may be obscure and the exact cause is commonly in doubt. A retained placenta, placental polyp, pedunculated fibroid or hydatidiform mole is suspected. Placenta accreta and the couvelaire uterus must be diagnosed carefully and managed with precise care. Obscure causes of hemorrhage during and after delivery concern rupture of the uterus and ruptured vein in the base of the broad ligament and unless one is

alert may not be discovered in time.

Conditions which can be easily diagnosed following delivery, and can cause persistent bleeding include tears in the cervix and base of the broad ligament, vaginal lacerations, lacerations of the clitoris, and hematomas of the perineum forming in episiotomies.

Much of the art of obstetrics lies in a knowledge of these obscure problems and their treatment, and experience of mismanagement with resulting lessons of our ignorance and omissions.

ABDOMINAL MANAGEMENT

Certain problems of postpartum hemorrhage are best handled by the abdominal route; among these are couvelaire uterus, certain fibroid abnormalities, rupture of the uterus, vein rupture in the broad ligament and chorionepithelioma. Of this group, abruptio placenta which has produced severe hemorrhage into the myometrium—couvelaire uterus—which has shown no response to massage and oxytoxics, should be treated with abdominal hysterectomy. To delay will often end in tragedy for the mother. Lesser problems of premature separation will be better managed by measures to correct blood loss and to maintain firm contraction of the uterus.

Rupture of the uterus demands haste. It is essential to replace most of the blood loss immediately and to approach the bleeding site by a good quick abdominal exposure. The obstetrical attendant must always be aware that uterine rupture may occur not only after cesarean section, intrauterine manipulation and labor forced with pituitrin but also during or after normal labors.

Most fibroids of the uterus, cause little trouble during or after pregnancy, despite their size and numbers. A submucous fibroid which is quiet during the prenatal and deliv-

ery stages may, after delivery of the placenta, cause a massive hemorrhage. This may be part of a necrotic condition, or a result of a leaking blood vessel in the capsule of the tumor. In either event, the most intelligent treatment is abdominal hysterectomy or, in a selected case, a myomectomy.

The most malignant tumor in the female pelvis is the rare chorionepithelioma. Our only hope lies in total excision of the uterus, ovaries and involved tissues.

There are a few less common intra-abdominal hemorrhages which must be treated by abdominal operation. These include ruptured vein of the broad ligament, ruptured veins on the surface of fibroid tumors and rare bleedings and torsions of the tubes and ovaries.

VAGINAL OR ABDOMINAL MANAGEMENT

Failure of the uterus to contract actively after delivery may be due to primary dysfunction, or it may be a secondary process from premature separation of the placenta, retention of placental fragments, trauma of delivery or a long labor from over-sedation. Fibroids of the uterus can cause hemorrhage by their space occupying qualities with subsequent atony or subinvolution. They may act through circulatory changes such as necrosis or increased vascularity or when the fibroid weakens the uterine wall and causes actual rupture.

The most common type of atony occurs without apparent cause. The uterus, after delivery, remains large and boggy, and vaginal bleeding persists. This may exist immediately after delivery, persist throughout the hospital stay, or may make its delayed appearance at home. All measures should be instituted to rule out the presence of placental products or organic causes. With these excluded there remain many

who bleed persistently. Supportive measures include oxytocics, uterine massage and blood transfusions.

In an effort to avoid hysterectomy in those cases which have failed with less radical therapy, we have had success in using one ampule each of Ergotrate and pituitrin in 1000 cc. 5% dextrose in water intravenously. This combination of oxytocics is given slowly by IV drip at the rate of 30-40 drops per minute, allowed to run slowly, the patient permitted to clamp the tubing when uterine contractions, abdominal pains or chest pains become severe. The average time necessary to complete 1000 cc. by vein has been from 5 to 7 hours. Bleeding of patients with atonic uteri, who were considered candidates for hysterectomy, responded promptly. All recovered completely without further treatment. One patient received two treatments as here described on consecutive days. This method has worked particularly well in cases of prolonged and severe bleeding. The uterus is maintained in a constant state of contraction and bleeding reduced to a minimum in a short period of time. We believe this a step that should be considered and attempted before reaching the more radical decision of hysterectomy.

VAGINAL MANAGEMENT

Partial or total inversion of the post-partum uterus, either as an acute or chronic disease, can cause fatal bleeding. After diagnosis and general preparations have been made, consideration should be given to the use of vaginal packing. Ergotrate-pituitrin solution as described above is useful in maintaining contraction of the uterus. Combined vaginal and abdominal manipulations are successful in well over one-half these cases. Longitudinal incisions in the cervix and lower uterus may aid in replacement. Abdom-

inal replacement of the uterus by clamp and suture traction is occasionally necessary. Hysterectomy, vaginal or abdominal, is rarely indicated in these days of chemotherapy, blood transfusions and skillful management.

Vaginal approach in management of postpartum hemorrhage is the commonest, least shocking and in indicated problems, most successful of the means of combating bleeding. A woman who is depleted by blood loss and in shock is no candidate for any procedure except blood replacement and possibly pressure to bleeding site.

Retained placental fragments—whether extra lobes, membranes or mere tags of tissue—can give alarming hemorrhage. Placenta accreta and the poorly separating placenta delay involution and produce stubborn moderate bleeding. Rough manipulation of tissues softened by pregnancy and delivery will give rise to fresh hemorrhage and further problems.

Placental polyps, pedunculated fibroids and uterine new growths usually cause bleeding following delivery, full-term or premature delivery, or in tubal pregnancy. Loose intrauterine tumors may cause miscarriages and premature labors in addition to postpartum hemorrhage.

The placenta implanted low in the uterus will, after delivery, cause increased bleeding because of poor contractibility. The vascular placenta bed will bleed a new mother into shock and danger unless intervention is quick and effective.

Cervical, broad-ligament, vaginal and perineal tears, either as spontaneous affairs or as result of instrumentation, cause bleeding to a slight or severe degree. Many large vaginal tears bleed slightly, whereas tears into the broad ligament base with involvement of the uterine vessels can yield hemorrhage of near fatal

proportions in a matter of minutes. Malignant tumors of the cervix, vagina and perineum exaggerate dangers in this regard as do the ulcerative and infectious diseases. These include venereal warts, lymphogranuloma inguinale and granuloma inguinale.

The clitoris and labia are rich in blood supply and even small tears may yield gushing hemorrhage, difficult to suture.

The new mother with atony, anemia, dehydration and fatigue, is an excellent candidate for hemorrhage. Her usual blood loss from the uterus and episiotomy may only be the initiation of rapid and fatal hemorrhage. Experience may not give us specific reasons for bleeding in this type of patient.

DISCUSSION

To judge of hemorrhage after delivery on a volume basis is difficult and misleading. Measurement of blood loss by direct means, red blood cell counts, hemoglobin determinations, blood-dye study, pulse and blood pressure responses all have great limitations. Blood loss of 500 cc., may be of little import to a large, healthy, non-anemic new mother, whereas in a small weak anemic woman this volume of hemorrhage may mean death. Obstetrical shock is really blood-loss shock.

Acute hemorrhage after delivery is spectacular and alarming. It will attract the attention of even the less attentive obstetrician. Of equal importance and of great danger is slow, constant, quiet postpartum bleeding. The victim will lapse into deep shock despite her own physiologic reflexes and responses. She may have an irreversible shock syndrome from which she fails to recover despite all late supportive measures. Pituitary insufficiency from postpartum hemorrhage, as described by

Shuhan and Murdock², gives interesting sidelights on late complications of this process. Their report should intensify our efforts in treatment of this disease.

Treatment of postpartum hemorrhage should be directed to saving blood, replacing blood, and treatment of the particular cause of the hemorrhage. The general emergency measures of plasma, oxygen, vasopressors, oxytocics, uterine massage, Trendelenburg position and wrapping of the extremities with elastic bandages are usually only life-saving bridging steps until the real cause of bleeding can be diagnosed and treated. As to the general methods of treatment, if we are given a choice of vaginal or abdominal technique in controlling the hemorrhage we would all choose the vaginal approach which has the advantages of speed, exposure and no peritoneal contamination.

PROCEDURE

First step in treatment of hemorrhage is digital and visual examination of the vagina. At this time one must be prepared to repair lacerations, suture varicosities, remove placental remnants, polyps or pedunculated fibroids. Vaginal survey will confirm the diagnosis, often stop the hemorrhage and, equally important, correct proposed misdirected treatment.

Vaginal survey may expose catastrophic bleeding which may have to be treated by emergency techniques such as vaginal manual compression of the uterine arteries, vaginal clamping of the vessels, or even vaginal suturing of these arteries. Less radical is the technique of pushing the uterus well up into the abdomen and holding it firmly, or an attempt at manual compression of the uterus with fist in vagina

2. H. L. Sheehan and R. Murdock: *J. Obst. & Gyn. Brit. Emp.*, June, 1938.

and firm pressure on the abdomen. Pituitrin can be injected through the abdominal wall, or by vagina, into the uterus. Direct injection of pituitrin into the uterus may have some advantage over intramuscular or subcutaneous injection, because local absorption extends only a short distance. End reaction of direct injection of pituitrin into the uterus is through vein absorption and general systemic circulation.

The hemorrhaging postpartum uterus could be explored digitally. The uterine cavity should be completely outlined and surveyed. A sponge forceps on the anterior lip of the cervix will draw the fundus to within inspection range and a sweeping finger will disclose much. The blunt sponge stick and the large dull curette are most useful for this survey and treatment. Exposed intrauterine lesions such as retained placenta, polyps and pedunculated fibroids are quickly removed by this technique.

If the vaginal uterine survey by finger or instrument reveals a rupture of the uterus or a submucous

fibroid as the cause of hemorrhage, preparation should be made for abdominal operation. Necessary blood for transfusion and anesthesia safety is paramount. The choice of hysterectomy, myomectomy or simple suturing of the rupture are to be made after the abdomen is open.

Use of intrauterine pack has been avoided in this discussion because we feel there is little remaining use for this procedure.

SUMMARY

1. Postpartum hemorrhage is the most important of the causes of maternal deaths today.
2. The vaginal and abdominal management of the conditions causing hemorrhage after delivery should be wisely and quickly executed.
3. Estimation of blood loss in postpartum hemorrhage is not dependable as a guide to management.
4. A new method in the use of intravenous pituitrin and ergotrate is suggested for atony of the uterus following delivery.

A New Vasoconstrictor

The new nasal vasoconstrictor, "Otrivin" (Ciba) was prescribed for 74 adult patients of both sexes who were observed at the author's office or at the Otolaryngology Clinic of the Veterans Adm. Center, Los Angeles. All had received other nasal solutions previously. Each patient received a 15 cc. ($\frac{1}{2}$ ounce) bottle of the Otrivin solution and was instructed to use three drops in each nostril three times a day if

necessary. Thirty-six patients had two courses of treatment and 14 had three or more, each course lasting for one to two weeks.

Otrivin relieved nasal congestion for from 5 to 6 hours in 73 patients—a longer period than that observed with other vasoconstrictors. There were no complaints of smarting, headache, flushing, or fullness. No pressor effect was noted.

H. Steinberg, *Calif. Med.*, 78:507, 1953.

Disability Evaluation

The determining of anatomic and physiologic alterations and their influence on loss of function

EARL D. MCBRIDE, M.D., *Oklahoma City, Oklahoma*

It is when the extent of disability must be measured in terms of a percentage loss that there is a hesitancy in accepting the responsibility.

Evaluation of disability requires something more than medical knowledge. The subject must be studied in all its various phases, including the various regulations established by law.

Most uncertainties and perplexities arise because the evaluation of disability is chiefly of economic importance. A claim for damages, or compensation award, arises only where some party other than the injured is held liable. The interest of the third party in such cases transforms the Doctor-Patient privacy to one of public commitment. The interjection of controversy places a monetary value on medical opinion and both sides seek the most favorable testimony. Thorough preparation on the part of the medical witness is the best insurance against embarrassment.

The economic basis of disability evaluation usually is established

through the process of law. The medical basis is that of determining the anatomic and physiologic alterations and their influence on the loss of function, the consequence of which is the loss in earning capacity.

Medical opinion will be influenced greatly by:

1. The statutory definitions of disability values as established for pensions, or compensation awards.
2. Medical opinion based on loss of function.
3. The grading of partial permanent disability, based on amputation.
4. The wage-earning capacity as affected by disability.
5. Reactionary factors of economic and social importance.

STATUTORY INFLUENCES

There is a more-or-less uniform pattern in the various pension, or compensation laws. The awards for disability, under the compensation act, are fixed amounts, according to specified amputation levels, loss of

sight, or loss of hearing. Total permanent disability is usually awarded for loss of both legs, both arms, or both eyes.

Where the limb is not amputated but is only partially permanently disabled, the percentage of loss will depend on the opinions of the medical experts. The extent of disability is assessed as loss of earning capacity, which is determined by the court after hearing the evidence.

The various schedules for pensions and industrial disabilities are not based on scientific deductions; they have been handed down through traditional enactments, and are a compromise for the sake of expedience. The percentage of disability, as determined through medical opinion applies only to the loss of earning capacity as defined through the limits of the law.

MEDICAL OPINION

The medical evaluation of disability is the weighing of the anatomic and physiologic losses as they involve functional loss. The court will then translate such losses into terms of wage loss. This process will require the following:

1. A thorough history and examination that will bring to light all factors relating to anatomic and physiologic alterations.
2. Inquiry into influences that will reveal the possibilities of rehabilitation and re-adjustment.
3. Measurement of the percentage of functional capacity in view of the anatomic and physiologic factors.

HISTORY AND EXAMINATION

The history of an injury must be more detailed than ordinarily in case a claim is to be established, or settled.

In relating the history the claimant exaggeration may result from

fear, greed, or desire for revenge. The exact manner of occurrence of the injury must be well established, also its seriousness and details of immediate and later treatment may form the bases for the opinion later to be expressed. The examination should be systematic and thorough. The positive clinical, roentgenographic, and other laboratory findings are necessary to substantiate, or negate, subjective symptoms and complaints.

ANATOMIC AND PHYSIOLOGIC ALTERATIONS

Anatomic and physiologic evaluation of disability is based on the physical changes in the body and their effect on function. The opinion on extent of disability is often greatly influenced by the revelations of the roentgenogram. It is often necessary to recognize overemphasis on pain, distress, anxiety, atrophy, or weakness.

Actual mechanical alterations such as joint limitations and angulation of the bone shafts create permanent physiologic states and dynamic alterations in the working force and energy requirements which can be measured.

REHABILITATION AND READJUSTMENT

Disability should not be designated as permanent until the maximum improvement has been reached. The readjustment and rehabilitation of a disabled person depends upon many complex factors involving the mind and body of the individual. Social and economic opportunities and disadvantages play an important role. Remaining capacity to work should be determined irrespective of environmental circumstances. Factors such as refusal of the employer to rehire, or the lack of employment opportunities, do not enter into the physiologic or functional aspects of disability.

FUNCTION AS A YARDSTICK OF DISABILITY

The measurement of function is the index to disability evaluation. No matter what anatomic or physiologic alterations may be found on examinations, the extent of disability will be the loss of function produced by such changes. How is it possible to measure function? Can it be measured by determining anatomic shortcomings? Does the degree of limited motion equal the loss of function? Does the extent of shortening indicate a specific extent of functional loss?

The author has devised a measuring rod of function which has stood the test of time in converting the loss of function into percentage of disability. It is as follows.*

	%
1. Quickness of action	10
2. Security	10
3. Coordination	20
4. Strength	20
5. Endurance	20
6. Safety as Workman	10
7. Re-employment examination .	10
TOTAL	100

An example of this measuring rod may be applied to the following case:

A knee joint injury has the following clinical findings:

1. Limited motion without pain
180° extension, 45° flexion
2. Normal stability
3. No deformity
4. No progressive articular changes.

A reasonable evaluation of the functional loss would be as follows:

1. Quickness of action
35% of 10—value of factor= 3.5%
2. Security
25% of 10—value of factor= 2.5%
3. Coordination
25% of 20—value of factor= 7.0%

* Disability Evaluation; McBride, E. D., 5th Edit. 1953; Lippincott Co.

4. Strength

25% of 20—value of factor= 5.0%

5. Endurance

40% of 20—value of factor= 8.0%

6. Safety

35% of 10—value of factor= 3.5%

7. Reemployment

25% of 10—value of factor= 2.5%

Sum of loss of function32.0%

Many other problems such as the evaluation of multiple disabilities become involved in making evaluations in percentage of disability.

THE GRADING OF DISABILITY EVALUATIONS

There should be all possible consistency in the evaluation of disabilities from the extremely minor to the most severe. For example, an individual and those interested in his claim might contend he has 30% permanent disability due to a back injury. This extent of disability would be about the same as the statutory rating for an amputation of the leg below the knee. Which of the two injuries is the more disabling? An injury fracturing the radius and ulna with moderate degree of bowing, might give rise to a claim of 25% loss of usefulness of the arm. How would such a disability compare with the amputation of a thumb which would be rated by the statutes at 24% of the arm? Such comparisons contribute to consistency if carefully observed.

Another method of grading is to classify the seriousness of disabilities from the very minor to the maximum degrees.

	%
1. Low degree, or very minor	5 to 20
2. Moderately low minor ...	20 to 35
3. Moderate degree to medium ...	35 to 50

4. High moderate to low major 50 to 65
5. High degree major 56 to 80
6. Maximum 80 to 100

WAGE EARNING CAPACITY

The compensation laws concern themselves with disability as an economic loss. Either wages are lost, or there is a loss of ability to perform services for wages or occupational activities for gain. If the loss could be fairly measured in all cases on the basis of actual loss entailed and translated into money, the objective of logical determination of the extent of disability would be accomplished. This is the function of the court which must weigh the evidence.

Where the medical evaluation of the extent of disability can be determined fairly, the court usually can establish the loss of wage earning capacity. Only too often the medical opinion is a conclusion based on sentiment or on one-sided, dogmatic preconceptions. The more confusing factors which influence medical opinion are pain and other subjective sensations which seem to interfere with ability to return to work.

EVALUATION OF PAIN

Pain cannot be ruled out by physical or laboratory examination. The pain threshold is very much the same in all persons. Their reaction to it differs widely. A person's reactions vary with his previous experience with pain, his mental balance, his life situations, his misapprehensions and worry concerning

the significance of pain and a desire, or lack of desire, to keep on with his work. It requires profound experience in the practice of medicine to evaluate the significance of pain.

Other factors which often influence the opinion on extent of disability may be termed reactionary factors:

1. Rehabilitation obstacles
2. Limited occupational opportunities
3. Economic handicaps
4. Limited educational background
5. Adverse incentive toward work
6. Adverse social relations
7. Unfavorable labor situations
8. Age limitations
9. Unpredictable exacerbations of pain
10. Other body impairments or disease.

Fundamentally medical opinion should not include such factors. The only practical escape from such reactionary factors is to limit medical opinion to loss of function, based on the pathologic findings at thorough examination. Impressions from any other factors should be expressed only when called upon to do so.

SUMMARY

Disability evaluation is a subject that cannot be adequately covered in brief discourse. The suggestions mentioned here are little more than an outline of the subject. It is only by persistent presentation of the subject that its importance may be adequately considered.

Substernal Pain and the Functional Esophagus

An attack of esophageal spasm may sometimes be undistinguishable from an acute myocardial infarction

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INTRODUCTION

Functional aberrations may involve any one of the many organ systems, either singly or in combinations. They produce symptoms that may be obscure, vague, often suggestive of serious organic disease, and frequently cause the patient more distress and disability than those of true disease. Diagnosis entails a careful search for organic disease, using the history as a guide to the examination, and all the supplementary tests deemed necessary. In the cases where a diagnosis of definitive organic disease is established, treatment is instituted as a matter of course. Treatment is just as definitely indicated when all x-ray and laboratory tests are negative, and the physician concludes that the symptoms are the product of functional illness. Unfortunately, these cases frequently get haphazard treatment or no treatment at all due to lack of time, sympathy, or understanding. The patient with functional illness is entitled to as

much attention and care as the cardiac, cancer, and ulcer patient even though his management is more tedious, time consuming, and often less gratifying.

Physicians are trained to explore and exploit any symptom that may be a clue to serious illness, but knowing that illnesses of function are neither death dealing nor life shortening, they tend to disregard the vague aches and distresses that arise from such a disturbance. All such symptoms are consequently relegated to "psychoneurosis". A careful analysis, however, would make it possible to locate the specific site of difficulty. It is true that in functional problems, the patient should be treated as a whole individual because the difficulty in the organ affected is secondary to the general personality and situational problems. It is also necessary, however, to know the specific organ involved and the nature of the involvement.

DEFINITION

The esophagus is not a passive hollow tube. It has the capabilities and is subjected to the disabilities that can occur in other parts of the gastrointestinal tract. Esophageal tension is one of the most commonly encountered of functional problems. It is seen daily by the busy practitioner but is rarely recognized and generally mismanaged. The physiology follows the general pattern of functional disorders. Increased parasympathetic activity, secondary to emotional tensions and conflicts, increases the tonus of the resting muscle (the muscle in diastole) or, in the severer form, can create actual spasm of the muscle. The increase in tonus or tension may be transient or may persist for days, weeks, or years. This is very similar to the tense or "spastic" colon. Increased tension of the esophageal musculature will neither compromise the lumen nor obstruct the passage of food. It is, therefore, like the spastic colon, not demonstrable by x-ray. Increased tonus will offer increased resistance to the distension of a recording balloon.¹ Under sufficient stimulus, the trigger may be tripped and actual spasm of the muscle occur. At such time, the lumen is narrowed and swallowed materials have difficulty getting through. This may be demonstrated by fluoroscopic barium studies and recorded by x-ray. Spasm, however, is a sudden severe contraction of muscle that cannot be maintained over long periods of time.

Persistent tension of the esophagus and short-lived spasm of the esophagus can be differentiated clinically, although attacks of spasm may be superimposed on tension. It has been proposed that a sustained increase in tonus be called

"tense esophagus" to distinguish it from "esophageal spasm" even though they are the same process with different degrees of severity.²

Spasm of the esophagus, like spasm in any other muscle, is painful. The pain occurs under the sternum or in the epigastrium and may follow the same pattern of radiation as cardiac angina. It may go directly through to the back, to the neck, to the axillae, to the left shoulder, and down the left arm. Like cardiac pain, it frightens the patient and causes a sense of impending doom. It may be associated with choking, salivation, dyspnea, tachycardia, sweating and even syncope. Frequently, there is a great deal of belching during the episode. Attacks come mostly at night awaking the patient from sleep. At the time of the acute attack, it is indistinguishable from one of cardiac origin. Relief will come from an effervescent antacid, morphine, or may occur spontaneously after about 30 minutes, leaving some residual sub-sternal soreness. Such episodes may recur at variable intervals coming nightly to once every few months or years.

Whereas spasm gives pain, the abnormal increase in tonus of a muscle will produce a sensation of awareness or heaviness depending on the degree of tension and the threshold of the individual. The tense esophagus is a low grade chronic offender. Here the outstanding symptoms are substernal pressure or fullness, the well known "globus hystericus", dysphagia, frequent continuous belching, heartburn, and eructation. Symptoms will become better or worse depending on the emotional state of the individual. Exertion or eating have very little bearing on the symptoms. Continuous belching without relation to

1. Payne, W. W., Poulton, E. P., *J. Physiol.*, 63:217, 1927.

food intake is the hallmark of the tense esophagus. Dysphagia without x-ray evidence of obstruction points to the functional tense esophagus.

DIAGNOSIS

The diagnosis of functional tense esophagus and esophageal spasm is therefore made on the basis of symptoms in the absence of objective findings. A diagnosis of functional illness must never be made on the basis of symptoms alone. Whereas this is frequently possible in that the patient is obviously of the "psychoneurotic type" and the symptoms are highly suggestive of functional disorder, it must be remembered that "nervous people" can also be the victims of organic disease. A thorough investigation by examination and whatever tests are indicated must be made first and only then, on the basis of the negative tests may the diagnosis of a functional cause for symptoms be made.

In addition to functional aberrations, unrelated organic disease may be found. For example, a woman with fibroids may also have spastic colon, or, as reported in one of our cases, a silent gall stone was noted in a patient with tense esophagus. When this occurs, the two conditions must be regarded as separate and unrelated entities and must be treated as such.

Disorders of function may also be caused reflexly by other disease. Tense esophagus may be secondary to duodenal ulcer, gall bladder disease, colitis, etc. An irritative focus in the gastrointestinal tract or other organ system may, by creating reverse peristalsis or a holdup of normal peristaltic action, initiate a state of tension or actual spasm in the esophagus. The delineation and treatment of such an irritative focus is obviously essential to the management of the esophageal problem.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis of esophageal tension states poses a specific challenge. The esophagus lies in proximity to the heart, lungs, and great vessels so that pain emanating from the chest alerts the physician to the possibility of disease of a serious nature. We have become familiar enough with the vagaries of early myocardial infarction, pulmonary tumors, etc., not to take lightly even minimal chest symptoms. On the other hand, carrying a patient as a cardiac "just to be on the safe side" even though there is no objective evidence of heart disease is extremely unfair. The layman is also aware of the serious implications of undifferentiated chest pain. If by careful study a diagnosis of functional derangement of the esophagus can be made as the cause of the symptoms, it is poor practice to deny the patient the reassurance of the comparative benignancy of the condition and the relief that proper treatment will afford. Many patients have been treated as cardiacs for years, unnecessarily limited in their activities, and the threat of sudden death hanging constantly over their heads. Such a mistake in diagnosis is as crippling as heart disease itself, particularly in the nervous type of individual in whom functional esophageal symptoms may develop.

Cardiac Disease. The nervous pathways that relay heart pain are similar or identical to those of the esophagus so that, as previously stated, an attack of esophageal spasm coming in the middle of the night, may, at the time of the attack, be indistinguishable from an acute myocardial infarction. Severe substernal pain radiating to the back, to the left shoulder and arm, associated with tachycardia, pallor, sweating and dyspnea may be seen

in either condition. The patient with esophageal spasm is more likely to be pacing the floor anxiously, with continuous rapid belching in an effort to relieve the pain. There may be a history of previous similar episodes without intervening angina of effort. The age of the patient may be helpful. Esophageal spasm is more common in women in their forties while myocardial infarction is more common in men in their fifties and sixties. In any event, severe substernal pain must initially be considered as a possible acute myocardial infarction until proven otherwise. Serial electrocardiograms and the absence of the other known criteria in the ensuing days should free the heart of suspicion. Barium studies may or may not show a hold-up at the cardia. Persistent substernal heaviness with dysphagia and food "sticking" under the sternum implicates the esophagus. Recurrent nocturnal episodes without objective evidence of heart damage or disease will help establish the diagnosis of functional esophageal spasm.

The substernal pressure of the tense esophagus is frequently confused with cardiac angina. However, it is neither produced by effort nor relieved by rest. Tense esophagus may be associated with belching, dysphagia, frequent swallowing, and a sense of fullness in the throat (globus hystericus). It is worse when the patient is overfatigued or under undue emotional stress. The taking of food may relieve but the oppression will return shortly after eating. The patient will frequently complain of food "hang" under the sternum at the level of the distress. Normal electrocardiograms without change after an exercise tolerance test are helpful in ruling out cardiac angina. Fluoroscopic barium studies are again valuable and, depending on the state of the emotions

at the time of examination, may or may not show changes in the esophagus. If spasm is seen fluoroscopically, the diagnosis is established. Frequently, in our experience, a hold-up of barium may be seen in the lower esophagus in an apprehensive patient on his first visit to the office. On repeat studies a day or two later after the examinations are finished and the patient's fears have been allayed by reassurance, barium will be seen to pass through the esophagus without delay. Such a sequence of events is proof-positive that the physician is dealing with functional tense esophagus, particularly when abetted by a long history of recurrent episodes of persistent substernal oppression related to emotional tension states with intermittent periods of complete freedom in an overly tense individual.

Tumors of the Esophagus. Any history of difficulty in swallowing makes careful roentgen study of the esophagus mandatory. The diagnosis of functional disorder of the esophagus must never be entertained until neoplasm is definitely ruled out by negative x-rays. Symptomatically, the dysphagia of the tense or spastic esophagus may remain static for long periods or may come and go depending on the emotional state of the patient, whereas the difficulty in swallowing associated with neoplasia is invariable progressive, involving solids first and then liquids. The pain of neoplasm is usually a late manifestation and is constant, gnawing, or boring in nature, in contradistinction to the sense of dull oppression of the tense esophagus.

Cardiospasm. The differences and similarities between cardiospasm and spasm of the esophagus have long been a disputed subject.² The

2. Friedenwald, J., Morrison, I. H., *Southern M. J.*, 16:341, 1923.

author believes that they are separate and distinct entities.³ Cardiospasm is a paralysis of the esophagus due to organic parasympathetic failure whereas the tense esophagus and esophageal spasm is due to functional parasympathetic overactivity. In the author's experience, tense esophagus is invariably found in very emotional or overtense people whereas cardiospasm is not. Dysphagia and substernal oppression are common to both illnesses. Vomiting of large quantities of undigested food is seen in cardiospasm but not in tense esophagus. The progressively increasing dilatation of the esophagus (megaesophagus) seen in cardiospasm is not found in spastic esophageal states even after fifteen or more years standing. The definitive diagnosis of cardiospasm, therefore, rests on the roentgen findings. In the differential, the diagnosis of functional spastic state is made only in the absence of demonstrable esophageal dilatation.

Strictures and Webs—These conditions of the esophagus may be suggestive symptomatically but can readily be ruled out by x-ray studies in the absence of persistent defects or deformity. Esophagoscopy may be of value if deemed necessary.

Peptic Esophagitis—An inflammation which may simulate functional spasm. In acute esophagitis, there is burning pain partially relieved with antacids. Dysphagia may or may not be present. Foods may burn on their way through the esophagus. In chronic peptic esophagitis, scarring occurs at the cardia with the development of the "rat tail deformity" as seen by x-ray. Esophagoscopy will demonstrate the inflammatory involvement.⁴

Hiatus Hernia—This is a difficult problem as it may be associated with functional tense esophagus. Here again, careful roentgen study will demonstrate the hernia. Nocturnal heartburn after lying supine is indicative of hiatus hernia, as is increased difficulty on bending. Heartburn or substernal burning coming about an hour after eating, relieved by antacids and unrelated to emotional states indicates hiatus hernia.

Belching is a symptom that bears special emphasis. The belch after a hearty meal is the normal physiological escape of excess air from the magenblase of the stomach. The so called "aerophagic" patient, however, who belches continuously without relation to meals is suffering from esophageal tension. This type of belching is more pronounced during periods of emotional stress and is usually associated with substernal or epigastric distress. Under fluoroscopic observation, the cycle is readily apparent. The repeated swallowing, usually an unconscious act, carries air into the esophagus. When filled, the esophagus is emptied with a noisy belch and the cycle is repeated. Aerophagia is not just a bad habit performed or discontinued at will. The act of swallowing air affords temporary relaxation of the tense esophageal musculature. When the tension persists over a period of time, the repeated swallowing becomes an automatic, unconscious act.

MANAGEMENT

The management of all functional illness is an exercise in the art of medicine. The problem automatically divides itself into two parts. First, the patient must be treated as an individual whose fears, conflicts, and situational problems are the basis of his functional disorders. Second, the patient's organ involvement and

3. Klein, H. C., *Rev. Gastroenterol.*, 19:861, 1952.
4. Winkelstein, A., *J. A. M. A.*, 104:906, 1935.

its symptoms must be treated.

The principles of the general management of the patient have been amply covered in the literature. Although it is difficult for the practitioner to unravel personality conflicts and situational problems, it is well to remember that the symptoms themselves create a fear of serious disease in the patient's mind which constitutes an added burden to an already overloaded system. Therefore, careful explanation and reassurance as to the nature of his illness is important and may, in itself, afford effective therapy.

Before any treatment of the esophagus itself is attempted, it is of course necessary to resolve any irritative focus that may be the cause of a secondarily involved esophagus. Peptic ulcer, cholecystitis, enteritis, renal infection, and others may be primary irritant foci. Tense esophagus is frequently associated with "spastic colon". Belching is common and persistent when, as a result of the spasm of the sigmoid, there is a large accumulation of gas in the splenic flexure.⁵ Treatment of the esophagus alone will not relieve the feeling of fullness in the left upper quadrant. Concomitant management of the colon is, therefore, necessary in order to achieve success.

The treatment of the esophagus and its symptoms will vary depending on the severity of the illness. In the mildest forms, such as those exhibiting occasional globus hystericus, reassurance alone may effect a cure. Simple antispasmodic therapy is helpful. Extract of belladonna in one-eighth grain doses with one-quarter grain phenobarbital four times daily is our drug combination of choice.

Moderately severe tense esophagus manifested by substernal op-

pression, dysphagia, and belching may respond to the simple plan outlined above, but usually requires the more stringent methods applied to the severe forms with superimposed attacks of painful spasm. Mechanical dilatation of the esophagus is specific and dramatically effective. The method is simple and safe and can be employed anywhere.

Esophageal bouginage is accomplished with a Hurst mercury weighted rubber bougie, size 50 to 60 French. The stomach should be empty. With the patient seated, the well lubricated tube is inserted into the back of the throat and deflected downward by the operator's finger. The patient is instructed to swallow, which serves to guide the tip into the upper esophagus. The patient then bends his head way back and the tube is permitted to descend by its own weight. As soon as it has entered the stomach, it may be pulled out. There may be some short pain as the bougie, passes through the lower esophagus. The entire procedure can be performed without assistance or anesthesia in a matter of a few minutes and the patient may eat immediately thereafter. There is no danger of perforation because of the tube's blunt rounded tip and its unforced passage. This procedure has been performed on people of all ages without difficulty or complication.

The effect of bouginage on the tense esophagus is most dramatic. People who have suffered from substernal distress and belching for years and have lived those years under a cloud of suspicion as cardinals, have experienced immediate loss of symptoms after a single dilatation. It is parallel to the degree of relief that bouginage affords for cardiospasm. It should be added

5. Dworken, H. J., Biel, F. J., Machella, I. E., *Gastroenterology* 22:222, 1952.

here that this is by no means a new form of therapy. It was known and advocated for functional esophageal conditions many years ago.⁶

Why dilatation should relieve tense or spastic esophagus is not clear. It is conceivable that muscle fibers subjected to prolonged tension may become fixed in their systolic state and can only be returned to diastole or rest by forceful stretching. This may be similar to the ability of a single well-placed injection of procaine to relax a long-standing spasm of skeletal muscle.

The relief following bouginage persists. Some of the author's patients have gone over three years without a return of symptoms. A few have required a second dilatation months later, but none have needed more than that. Our only failures have been in those cases of reflex tense esophagus in whom we failed to remove the primary irritant focus. These did not respond as

6. Hamburger, W., Erlangen, Enke, 1871.

well to bouginage and their symptoms returned after a variable interval.

The author has followed with interest the work done with oral procaine hydrochloride for the resolution of upper gastrointestinal tract spasm.⁷ Procaine is 0.5 gm. doses in a vehicle with adhesive properties such as liquid methylcellulose will relax a tense or spastic esophagus and is a good measure for temporary relief. It may be safely used as a good diagnostic tool in determining whether substernal oppression is of cardiac or esophageal origin.

SUMMARY

The syndrome of functional tense esophagus and esophageal spasm has been discussed. Differential diagnosis and management have been outlined. The value of mechanical dilatation as specific therapy has been stressed.

7. Roka, G., and Lajtha, L. G., *British Medical Journal*, 466:1174, 1950.

Evaluation of Phenylbutazone

Twenty patients with a diagnosis of peripheral rheumatoid arthritis, 4 with spondylitis, and 8 with spondylitis and peripheral joint involvement were selected for an evaluation of the clinical effect of phenylbutazone (butazolidin). Marked discomfort and unresponsiveness to other forms of treatment were distinguishing findings in this groups of patients. Their average age was 29 years. The drug was administered in the daily dose of 600 mg for two or three weeks, in most instances.

None of the 32 patients obtained marked objective improvement or a

clinical remission of the disease. Sedimentation rates were not lowered and none of the patients had more than a minimal reduction in swelling. However, the analgesic property of phenylbutazone was definitely observed. Marked to moderate relief of pain, stiffness and aching was obtained by 72 per cent of the patients.

No significant toxic reactions were observed. It is concluded that phenylbutazone is an excellent adjunct to the treatment of rheumatoid arthritis, but that it has no real anti-rheumatic action.

R. M. Patterson, et al, *U. S. Armed Forces Med. J.*, 4: 109, 1953.

HYALURONIDASE

Hyaluronic acid is a complex polysaccharidic derivative which has the chief function of binding the interstitial fluids and preventing their spreading. Hyaluronidase, on the other hand, is a protein and gives all the usual protein tests plus positive tests for phosphorus and sulfur. It is filtrable but does not dialyze through a semi-permeable membrane, which is soluble in water, saline solution and acid solutions, but insoluble in organic solvents. It is stable in solutions of high acidity, but is inactivated by trypsin and pepsin. It has enzymatic properties and has specific action on hyaluronic acid. The enzyme is widely distributed throughout animal tissues. It is found in the skin, kidneys, lungs, brain, placenta, and is especially rich in the testes. The testes of bulls is the commercial source. Bacteria contain hyaluronidase, in which case it appears to aid in the penetration of the tissues by the organism. Besides the occurrences noted above, it also is found in snake and bee venoms which accounts for their rapid spread. There is no evidence that it occurs in plants.

The simultaneous injection with interperitoneal solutions in order to hasten the absorption and spread of the active agent was one of the first clinical applications made of hyaluronidase. In this connection it has been used with nerve-block anesthetics, since nerve injection is not necessary. The onset of action is quicker and the duration of anes-

thesia shorter. The enzyme is extremely effective when large volumes of solutions are to be injected, for it quickly dissipates local congestion. Another therapeutic use is in the treatment of swellings, as it rapidly affects the local accumulation of fluids. It has been used with penicillin and other antibiotics in order to hasten the effect. Since the action of the enzyme persists for as long as 24 hours, it has been valuable in the treatment of painful swollen joints by decreasing the viscosity of the synovial fluid and thus decreasing the pain of movement. Another recently suggested use is in the prevention of re-occurrence of kidney stones. Hyaluronidase is effective in 80 per cent of the cases. Care should be taken, however, to ensure adequate dosage, since too small dosage may even hasten the formation of renal calculi.

For administration, extemporaneous solutions should contain 150 turbidimetric or 500 viscosity units per cc. in isotonic salt solution. Children under three years of age should not be given over 200 cc. and babies not more than 25 cc/kg. of body weight per day. The enzyme does not change the blood clotting time in normal individuals but may cause hemorrhages in certain cases. Finally, the enzyme is inhibited by various substances, such as sodium salicylate, congo red, cortisone, ascorbic acid, etc.

Indiana Pharmacist, May 1953, p. 139.

Diagnosis of Endocrine Disease

*No one procedure serves to
differentiate between the various
conflicting endocrine states*

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There is no one procedure which serves to differentiate between the various conflicting endocrine states. Considerable overlapping occurs and the laboratory findings can only serve as an adjunct to clinical observations.

About 50 per cent of cases of adrenal cortical hyperfunction will develop natremia, hypochloremia, hypopotassemia, and alkalosis. The Cushing syndrome variety will show increased urinary 11-oxygenated steroids and a normal or slightly increased urinary 17-keto-steroid excretion.

The adrenogenital type will have increased 17-keto-steroid excretion and normal or slightly increased 11-oxygenated steroid excretion. To determine the etiology of the adreno-

genital syndrome there should be administered for several days a daily dose of 100 mg of cortisone. If the basis is hyperplasia, the urinary 17-keto-steroids will decrease, while those cases due to tumor will show no change. Adrenal cortical hypofunction (Addison's disease) will have hyponatremia, hypochloremia and hyperpotassemia. A low salt diet will precipitate a crisis, with decreased blood pressure, azotemia and hemoconcentration. Four hours after the administration of 25 mg of ACTH the eosinophil count will be normal or reduced by less than 50 per cent in the Addisonian patient. ACTH (amount not stated) given every 6 hours for 24-48 hours will not produce the normal increase in urinary steroids. Urinary output af-

ter rapid (less than 40 min.) ingestion of 1500 cc. of water is less than 800 cc. in the Addisonian, compared with over 1200 cc. in the normal person.

Adrenal medullary hyperfunction (pheochromocytoma) may be distinguished by changes in the blood pressure. When the pressure is normal an intravenous injection of 200-300 mg of tetraethylammonium chloride will cause a marked hypertension in 3-5 minutes, and this can be controlled by having the patient stand upright. When the patient is in a hypertensive state, 10-15 mg. of benzodioxane (intravenously) or

2-4 mg regitine (intravenously) will cause a marked fall in pressure within 0.5 to 3.0 minutes.

Anterior pituitary hypofunction is characterized by a low basal metabolic rate, decreased uptake of radioactive iodine and decreased urinary steroids and gonadotropin. Myxedema on this basis (contrasted with primary myxedema) will usually show low urinary gonadotropin and an increase in protein-bound iodine, following the parenteral administration of 10 to 20 mg of thyrotropin.

Bull. New York Academy of Medicine, 29: 101, 1953.

Importance of Food in Preventive Medicine

The importance of nutrition in pellagra, diabetes, colitis, peptic ulcer and anemia is well known. Another area where food is of real importance is in the handling of the so-called febrile diseases. During fever there is an increased metabolism and therefore an increased requirement of certain nutrients. There is also an increased destruction of body tissues with the loss of nitrogen and often a disturbed water balance. Gastrointestinal diseases offer perhaps the greatest difficulties to the nutritionist. Malfunction of the G. I. tract may entail certain putrefactive changes which produce toxic substances. Deficiency of certain amino acids, it has recently been found, produce a rapid decrease in liver enzymes. The significance of these enzyme changes is not yet clear, but it is obvious that

the metabolism of the liver is not normal and diseased conditions may result either suddenly or after long lapses of time.

The so-called reducing diets are another special concern of the nutritionist. If one wishes to reduce, the total fuel taken in must be below the total fuel required. This can be accomplished in many different ways, but is easiest done by eating a large steak. The resulting high protein diet will not be harmful, provided all other nutrients, and especially vitamins and minerals, are supplied. Sound nutrition depends upon a balance between all nutrients at a given time. This balance is best obtained through the consumption of common foods that are to our liking.

C. A. Elvehjem, Am. J. Publ. Health, 43: 523, 1953.

Etiology and Treatment of Atherosclerosis

A carefully evaluated family history will often afford a clue to predisposition to atherosclerosis

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Atherosclerosis is a degenerative disease of the intimal coat, characterized by fibrous changes and increasing accumulations of lipids in localized areas. It is a focal pathologic change, a disease process which may be superimposed on the arteriosclerosis of aging or be present even in infancy. Elderly individuals may have rigid arteries with little atheromata, while the soft elastic arteries of the child may harbor early atherosclerotic fatty flecks. Roentgenograms of calcification of the vessels of the extremities give no indication of the intimal adequacy of the coronary vessels. Clinically the end result of atherosclerosis is rupture or occlusion of an end-artery. Medial calcification does not narrow the lumen of a vessel.

The first effort in detecting predisposition to atherosclerosis is an elucidation of the findings which may indicate that the investigated individual is predisposed to degenerative disease processes. A carefully evaluated family history will often afford a clue to such a predisposi-

tion. Heredity may involve a constitutional inadequacy of metabolism, indicated by familial gout, obesity, diabetes mellitus, hypothyroidism, coronary artery disease, and a host of other disorders associated with failure of metabolic processes. Hypertension may further accentuate susceptibility, especially during continued nervous and emotional tension.

Social and economic environmental factors may contribute importantly to the stress to which an individual is exposed. Males are more prone to the development of coronary artery disease, especially before the age of 50. This sex differential is not present in metabolic disorders, such as diabetes mellitus. The presence of any metabolic disorder either in an individual or his family strengthens this predisposition to degeneration. Biochemical determinations will afford further significant evidence. The determination of serum cholesterol and of phospholipid offers the cheapest as well as most useful approach to biochemical

studies. A search for atherogenicity should be included in the annual physical examination because patients with an inherited inferior metabolic system require earlier and more intensive treatment. Anticipatory and preventive treatment takes full cognizance of such factors

as heredity, morphology, psychology, immunology and biochemistry. It recognizes the non-specific nature of atherosclerosis and applies prophylactic, though non-specific therapy according to the needs of the individual.

Geriatrics, 8: 359, 1953.

Post-Cholecystectomy Syndrome

Post-cholecystectomy syndrome is defined as the persistence or recurrence of symptoms present before the removal of the gallbladder, or the development of symptoms referable to the right upper quadrant of the abdomen. The symptoms include pain, jaundice, fever and flatulent dyspepsia.

The reported incidence of the syndrome varies between 5 and 70 per cent depending on the disease process and the operative procedure. In discussing possible causes of the syndrome, attention is called to the close relationship existing between the gallbladder, liver and ductal systems. A diseased gallbladder is almost invariably one manifestation of a disease involving the whole biliary system and makes it difficult to define or assess liver involvement.

Apart from this consideration, the causes of the syndrome fall into two fairly well defined groups: (1) errors in diagnosis and (2) surgical complications or technical errors. The need for an accurate diagnosis is emphasized. The common bile

duct must be explored in every instance. It has been reported that 10-15 per cent of cases operated upon for removal of the gallbladder have a stone in the common bile duct. The incidence has risen as the number of common ducts explored has increased at the Lahey Clinic.

The dangers of leaving a long stump to the cystic duct include the reformation of a "gallbladder", which is most likely to occur when a stone is left in the common duct.

Obstructive jaundice developing soon after operation may be due to a stone in the common duct, or to a stricture resulting from incorrect surgical technique. When jaundice develops later in addition to the above causes, pancreatitis, carcinoma of the head of the pancreas or sphincter of Oddi, and long-standing hypertonic dyskinesia must be considered. Surgical errors, such as partial ligation of the common duct, and section of the ducts may be followed by a stricture of the common duct.

H. E. Mock, *Med. Clin. No. America*, 37: 169, 1953.

Endometriosis

Lower abdominal pain that escapes diagnosis invariably suggests endometriosis.

ROLAND BIEREN, M.D., *Washington, D. C.*

Lower abdominal pain in a woman that escapes diagnosis invariably suggests endometriosis. The fact that the condition is an ever increasing source of pain, dysmenorrhea and infertility in private patients is probably responsible for this. A clinic incidence of 5.61 per cent—which is exceptionally high—has been reported.

Endometriosis may be defined as a condition in which tissue resembling endometrium occurs in extra-uterine locations. Normally such tissue is present only as a lining of the uterine cavity. In endometriosis it occurs elsewhere in the generative tract, in the abdomen, the urinary tract, or in remote parts of the body. It is called *internal* when the endometrial tissue occurs in the wall of the uterus or fallopian tube; it is called *external* when it occurs on the external surface of the uterus, in the ovary, bladder, intestine, or various other places. Single, authentic lesions have occurred in such remote parts of the body as the posterior thigh and the pleura. However, from

the standpoint of diagnosis and therapy one need only consider generative tract lesions and those within or closely adjacent to the abdomen.

In order to arrive at the clinical diagnosis of endometriosis there must be present both symptoms and a definite mass on vaginal examination. When a mass is found it should be checked again after a cleansing enema. The invasion of strands and masses of endometrial tissue into the myometrium sometimes produces a globular enlargement of the uterus. When such is found with a persistent menorrhagia it may be inferred that endometriosis is present. In some cases a diagnosis can be made by curettage or on the basis of a uterogram. Most cases are diagnosed by the pathologist after hysterectomy.

Apart from adenomyosis, the lesions of endometriosis are characterized by the formation of "chocolate" cysts. When the nest of endometrial tissue becomes activated by some unknown stimulus it bleeds with

each menstrual period. As the monthly accumulation increases, it is contained within an enveloping mantle of fibrous tissue. If the cyst is in a location where it is relatively free it can attain considerable size before symptoms are produced. If it is adherent to other structures there is a limit to its size before pressure symptoms are produced. It is this limit which determines when symptoms will appear. Full-blown, painful "chocolate" cysts have been reported in women as young as 19.

Complications of endometriosis, fortunately not common, may be serious. Involvement of the bowel may cause intestinal obstruction. Cases have been reported in which such a lesion of the rectosigmoid has been misdiagnosed as cancer of the large bowel. Rupture of a "chocolate" cyst and consequent develop-

ment of an "acute abdomen" may also occur.

Treatment varies with the individual. When preservation of menstrual and child-bearing function is desirable, resection of the individual lesion is the treatment of choice. In an older woman for whom pregnancy is no longer desired the surgeon can be more radical. However, it is often impossible to resect completely massive lesions, and roentgen castration may be used as a final resort. Some women develop severe menopausal symptoms after castration. In these cases estrogen need not be withheld unless its use causes a painful lesion. In the latter instance, recourse may be had to small intermittent doses of testosterone to relieve hot flushes.

Med. Annals District of Columbia, 22:298, 1953.

Therapeutic Application of Ultrasonic Therapy

Chief indications for the use of ultrasonic therapy are the arthritides and allied rheumatoid conditions, including myositis and fibrositis, and disorders of the peripheral nerves, such as neuritis (especially that involving the sciatic nerve), neuralgia, causalgia, coccygodynia, and pain in phantom limbs.

The results obtained with this therapy are largely due to its thermal effects. Ultrasound definitely produces certain non-thermal effects, although these are still not well understood. The heat produced by sound waves is more penetrating and can be beamed with greater accuracy than other types of heat. When this energy is applied to living tissue in sufficient dosage, it can

produce irreversible destructive changes. Because of these potential risks, there are definite contraindications to the use of ultrasonics. The different techniques developed for the therapeutic application of sound waves must be understood and followed. Careful consideration must be given to dosage. Ultrasonic treatment should be administered only by experienced technicians.

Available evidence indicates that ultrasonic radiation is a local therapy without specific biologic properties, capable of producing analgesic effects without influencing the underlying causes.

G. M. Piersol, Postgraduate Med., 14: 24, 1953.

Prevention of Kidney Stones

*Permanent eradication of
infection is virtually impossible
until all stones are removed*

F. C. BARTTER, M.D., Baltimore Maryland

In general, stone formation requires three conditions in the urinary tract: (1) the presence of poorly soluble material; (2) insufficient quantities of water to keep this material in solution, and (3) in most, and perhaps all, instances, a nidus (cells, fibrin, bacteria) on which the stone may start. The last two conditions favor the formation of all types of stones, and the therapeutic and preventive implications, i.e., forcing of fluids and elimination of infection, are obvious. Permanent eradication of infection is virtually impossible until all stones have been removed.

The cause and prevention of the first condition depends on the type of stone which is being formed. "Pure" stones are composed of calcium phosphate, calcium oxalate, uric acid, or cystine. "Mixed" stones are most often composed of the first two, but either of the others may form a nidus on which calcium salts are deposited. "In vivo" roentgenograms afford a ready means for recognizing the "snowflake" appear-

ance of the calcium oxalate stone, the lamellated structure of the calcium phosphate stone, and the amorphous, "waxy" pattern of the cystine stone; on the other hand, the uric acid stone will not show up against the soft tissues. If a stag-horn stone is present, it is always either calcium phosphate or cystine.

Search for the cause of calcium oxalate and calcium phosphate stones may lead to the discovery of abnormalities involving the bones, parathyroid glands, kidneys, or the patient's dietary and drug habits. Decreased bone formation, or osteoporosis, while it is developing, leads to hypercalcuria and often to stones. The cause is often amenable to therapy. Destructive lesions of bone often lead to stones. Equally capable of producing kidney stones is the condition of hyperparathyroidism without bone disease, with elevated serum calcium and low phosphorus, and with normal alkaline phosphatase, bones, and lamina dura. Renal lesions leading to hypercalcuria include "essential hypercalcuria" and

"renal tubular acidosis." Pyelonephritis often favors the formation of phosphate stones. Hypercalcuria and resulting phosphate or oxalate stones may follow an abnormally high intake of calcium. The vitamin D therapy of arthritis, and the milk and calcium therapy of ulcer are therefore not without danger. The practice, in the latter instance, of adding alkali to the regimen adds still further to the chances of stone formation. Finally, calcium oxalate stones may result from an abnormally high content of oxalate in the diet, e.g., beet greens, rhubarb, spinach, etc.

Uric acid stones may be indicative of an elevated serum uric acid, which may in turn point to gout. However, in most patients with uric acid stones the serum uric acid is normal. An abnormally high intake of purine-containing foods (pancreas, thymus, liver, etc.) may lead

to increased urinary uric acid and its precipitation as a stone. Since the urate ion is relatively soluble, uric acid stone formation, once it is recognized, is usually easy to prevent. All that is necessary is to administer enough alkali to keep the urine neutral or alkaline, to limit dietary items especially rich in uric acid, and, of course, to keep the urine volume high.

Cystine stones are nearly always indicative of congenital cystinuria, a hereditary renal disease in which a number of amino acids are excreted in excess and cystine, being the least soluble, often forms calculi. Formation of these calculi may be prevented, and existing stone may be dissolved, by administering enough alkali to keep the urine neutral or alkaline. The diagnosis of cystinuria is readily made by testing the urine for cystine.

Virginia Med. Monthly, 80: 355, 1953.

Substitutes for Cow's Milk in Infant Feeding

The best substitute for cow's milk is soybean milk. If the latter is unsuitable, a formula using strained meat as a protein base can be used. The homogenized meats may be prepared at home, using a blender, or they may be purchased. Considerable and dramatic success has been experienced with atopic dermatitis (apparently due to sensitivity to cow's milk or soybean milk), and also in treating severe gastrointestinal disturbances in early infancy, due to sensitivity or intolerance to these two milks.

The "meat milk" is essentially a form of soup (just as soybean milk

is essentially a bean soup) and has a chemical composition similar to that of cow's milk. The taste is pleasant and it is readily accepted by the infants. Stools are similar in frequency and appearance to those obtained when a cow's milk formula is used. Experiments are under way using whale meat, now readily available in the American market, as the protein base for meat milks. Since no members of this family are widely used for food in this country; congenital sensitivity to whale meat is not to be expected.

J. Glaser, J. Pediat., 42: 734, 1953.

THERAPEUTIC TRENDS

Administration of Terramycin Parenterally in Pediatric Use

Administration of terramycin by hypodermoclysis was found to be a useful and practical mode of therapy for the treatment of infectious diseases of childhood. Serum levels of the antibiotic were determined following single doses to confirm the fact that the antibiotic enters the blood stream rapidly, and also to establish the proper dosage regimen. As a result of these determinations the authors recommend the routine employment of a concentration of 1 mg per cc.

In average infections a dose of 10 mg per kg of body weight should be given and repeated every 12 hours. In more serious infections doses of 20 to 25 mg per Kg every 8 to 12 hours may be necessary. They found that terramycin may be administered along with hyaluronidase without any evidence of incompatibility. Various vehicles were also tried and found to be satisfactory, including physiological saline, dilute dextrose solution, one-sixth molar sodium lactate solution, and Darrow's solution.

In summary, satisfactory responses were obtained by means of this therapy in a variety of the common infections encountered in pediatric practice.

W. J. Farley, L. Konieczny, *J. Pediat.*, 42: 177, 1953

Bell's Palsy Treated with Cortisone

Six early cases of Bell's palsy are reported to have been successfully treated with cortisone. The rationale is assumed to be the ability of cortisone to relieve the acute edema and inflammatory reaction of the facial nerve and its sheath, which cause marked compression of the nerve as it passes through the bony portion of the fallopian aqueduct. This allows for early restoration of nerve function.

The ages of the six patients thus treated ranged from 13 to 65 years, and treatment with cortisone was instituted within a few hours to nine days of the onset of palsy. The daily dosage of cortisone, which was given either intramuscularly or orally, ranged from 300 to 600 mg., given in divided doses at 4- to 6-hour intervals. This dosage was usually reduced slightly on the second or third day and then maintained at this level until almost complete recovery had taken place, when it was gradually tapered off.

The administration of cortisone was continued for 10 days in one case, for 11 days in one case, for 12 days in three cases and for 14 days in the remaining case. All the patients regained full recovery of movements within periods ranging from 10 to 13 days.

H. H. Rothendler, *Am. J. Med. Sci.*, 225: 358, 1953.

Actions of Sympathomimetic Amines on the Heart

The results of this investigation suggest that all of the commonly used sympathomimetic amines stimulate the human heart, although they differ considerably in their relative potencies. Weak cardiac stimulation associated with an elevation of diastolic pressure frequently causes reflex bradycardia which prevents increases in pulse rate.

The common sympathomimetic amines have here been arranged in their order of effectiveness in preventing reflex cardiac standstill. These data suggest that Isuprel, a vasodepressor compound, causes the most direct cardiac stimulation, the least stimulation being produced by the weak pressor compounds: ephedrine and Paredrinol. Intermediary between these two extremes are: Cobefrine, Levophed, Neo-Synephrine, and Sympatol. In proportion to the therapeutic dose, the least stimulating compound was found to be Neo-Synephrine. Levophed and Neo-Synephrine both cause reflex bradycardia in the absence of atropine. This is initiated by an elevation of mean blood pressure in the baroreceptive region of the large arteries.

Levophed appears to have special ability to maintain normal blood pressure under conditions of severe circulatory collapse, particularly when the causative mechanism was not loss of blood from hemorrhage. It also increases coronary flow, so that the damage in myocardial infarction after coronary occlusion is minimized—an advantage which is frequently of crucial importance for survival from severe cardiac damage.

M. L. Tainter, A. M. Lands, *New York State J. Med.*, 53: 1433, 1953.

Corticotropin (ACTH) and Cortisone in Pregnancy

The effect of ACTH and of cortisone was studied in 28 individuals. Twelve young multiparous females all of whom were in good health except one who had Boeck's sarcoid, were given more than 1000 mg of ACTH or cortisone over a period of more than three weeks. Sixteen females received 50 to 300 mg of ACTH or cortisone over a period of three to five days during the last two weeks of pregnancy; five of this group had toxemia of pregnancy when hormone therapy was started. Two of the patients who were given ACTH, and one who had received cortisone for Boeck's sarcoid, became pregnant during hormone treatment.

It is not believed that the hormones, in the dosages used, did alter significantly serum potassium or sodium and plasma chlorides; nor did they notably elevate the blood pressure, cause edema and excessive weight gain, produce or aggravate toxemia of pregnancy, alter labor or increase postpartum complications, increase the incidence of abortions, miscarriages or premature labor. The somatic and mental development of the infants was not retarded. One child (its mother had received more than 3000 mg of cortisone orally for treatment of Boeck's sarcoid before pregnancy, and 5010 mg during pregnancy) was lethargic and cyanotic for three days, suggesting hypoadrenal cortical activity; with oxygen therapy improvement was spontaneous. The adrenals of two premature infants, whose mothers had received ACTH weighed somewhat more than expected.

R. R. Margulis, C. P. Hodgkinson, *Obst. & Gynec.* 1:276, 1955.

AIDS IN DIAGNOSIS

Staphylococcal Infection of the Newborn

Inactivity, failure to feed, diminished crying, the onset of pallor, vomiting and fever, occurring in a baby who has suffered from minor staphylococcal infections are signs not to be ignored. One should be aware of the high incidence of minor staphylococcal infection in infants born in hospital and the knowledge that the majority of the staphylococci are penicillin-resistant.

The incidence of skin sepsis in two maternity units was 2.3% in each case and of conjunctival sepsis 4.1% and 4.2%. Most of these infections were due to the staphylococcus.

Cases are described illustrative of the serious lesions which staphylococcal infection may produce in the neonatal period, and comments are made on these cases, with particular reference to drug-resistant organisms, to bacteriological control of therapy, and to the difficulties of diagnosis and management.

An analysis has been made of the antibiotic sensitivity of organisms isolated from 56 separate staphylococcal infections occurring in a maternity unit during the year 1951: 76.6% of these were resistant to penicillin, 12.5 to streptomycin, 17.4 to chloramphenicol—only 4.5% to aureomycin.

J. O. Forfar, et al, *British Medical Jour.* 7:170, 1953.

Cancer of the Prostate

Only 5% of patients with prostatic cancer are operable when first seen—95% can receive palliation only. After admission with metastases, if palliative treatment is withheld beyond 9 to 12 months, in 70% of such cases clinical improvement can be achieved and life prolonged whether treated by estrogens or surgical castration.

Of 1,818 cases treated over the past 10 years by urologists throughout the country gain in weight, appetite, feeling of well-being, improvement of hemoglobin and red blood count, freedom from bone pain, improvement in urinary stream, and regression of pulmonary metastases was found to last up to two years in 55% of the cases; 75% were dead in 5 years; 20% were living and reasonably well for variable periods up to 10 years.

Edgar Mayer, *New York State Jour. of Med.*, 53:1647, 1953.

Sudden Death in Infancy

When an infant is found dead in bed, it is very unlikely that accidental mechanical suffocation has occurred. It is more probable that some natural but unrecognized disease process has been operating, which in 80% of cases is some form of acute respiratory infection.

W. B. Nevius, *Jour. Med. Soc. New Jersey*, 50:242, 1953.

The Diagnosis of Pernicious Anemia

It has been shown that pernicious anemia may simulate hypersplenism, aplastic anemia, and severe neurologic disease; a fourth case in which a diagnosis of P. A. was made was shown to be an acquired hemolytic anemia.

P. A. is a disease involving the entire hematopoietic system rather than the erythrocytes alone.

In some cases an associated iron deficiency will mask or obscure the diagnosis and delay the response to specific therapy.

Bone-marrow studies before treatment are diagnostic. P. A. cannot be diagnosed with any confidence after blood transfusions, liver extract, Vitamin B₁₂, or folic acid have been administered. It is important to establish the diagnosis before inaugurating any treatment.

Specific treatment is far superior to symptomatic therapy employing "shot-gun" medications.

Once treatment is undertaken for P. A. it must be continued for the lifetime of the patient. For this reason the diagnosis should never be made without adequate study.

F. A. Dreskin, *Journ. Sou. Car. Med. Assn.* XLIX 68, 1953.

Spinal Complications Following Lumbar Puncture

Four mechanisms are involved in the development of intervertebral disc or vertebral injury following lumbar puncture: (1) puncture of annulus fibrosus with escape of nuclear material and consequent thinning of the intervertebral disc; (2) impingement of the needle on the annulus fibrosus, setting up inflammatory reaction in the disc which leads to a gradual escape of nuclear material and subsequent thinning of the intervertebral disc; (3) ex-

trusion of nuclear material into adjacent vertebral bodies through a crack or defect in the cartilaginous plate, leading to development of Schmorl body, sclerosis of surrounding bone and thinning of the intervertebral disc, and (4) introduction of micro-organisms into the intervertebral disc or vertebrae by spinal needle.

Symptoms are characterized chiefly by severe back pain, muscle spasm over the lumbar area, tenderness over the lumbar spine and difficulty in bending, stooping or lifting. Radiographic evidence of spinal injury has been recognized as early as 18 days and as late as 6 months after lumbar puncture. In the majority of cases, x-ray changes become evident within 3 to 4 months. Only a slight erosion of the articular surfaces may be seen at first, but eventually the entire joint becomes involved. The most common x-ray findings are: (1) thinning of the intervertebral disc; (2) narrowing of the space between the respective vertebral arches and the intervertebral facets; (3) sclerosis of adjacent vertebral bodies, and (4) rarefaction and destruction of the vertebral bodies. Pease has in addition observed a compensatory widening of the intervertebral space above the affected one.

Treatment depends on the presence or absence of infection. If the injury gives rise to an inflammatory spondylitis due to the penetration of nuclear material into the spongiosa of adjacent vertebrae and there is no evidence of osteomyelitis, immobilization of the involved portion of the spine is all that is necessary. In all cases treated by proper immobilization by plaster body jacket (or a Taylor brace, later on), the patient recovered without incident.

S. F. Redo, M.D., New York, New York, *Surgery* 33: 690, 1953.